Amendments to the Claims

Please cancel claims 1-6 and 32-35 without prejudice to or disclaimer of the subject matter recited therein.

Please amend claims 9, 12-15, 31, and 45 to read as follows.

1-6. (Cancelled)

7. (Original) A control apparatus for a vibration type driving apparatus which comprises a vibrating body including an elastic body and an electro-mechanical energy conversion element, and a contact body in contact with the vibrating body, the vibrating body and the contact body are relatively moved by applying a plurality of driving signals to the electro-mechanical energy conversion element to excite a plurality of vibrations with the same shape and different positional phases on the vibrating body and combining the plurality of vibrations into a traveling vibration, the control apparatus comprising:

a driving unit which controls the driving signals such that the traveling vibration includes a traveling wave component whose amplitude is constant and a standing wave component whose positional phase changes.

8. (Original) The control apparatus according to claim 7, wherein the driving unit periodically changes amplitudes and phases of the plurality of driving signals with different time phases.

9. (Currently Amended) The control apparatus according to claim 7, wherein the driving unit periodically changes amplitudes of the plurality of driving signals with different time phases such that a position of the standing wave component is changed ~~in a direction of the relative movement of the vibrating body and the contact body~~.

10. (Original) The control apparatus according to claim 7, wherein the driving unit increases and reduces the standing wave component in accordance with a change in frequencies of the driving signals.

11. (Original) The control apparatus according to claim 7, the driving unit has a speed detector which detects a speed of the vibration type driving apparatus, and increases and reduces the standing wave component in accordance with the detection result of the speed detector.

12. (Currently Amended) The control apparatus according to claim 8 [[3]], wherein the driving unit comprises:

a speed detector which detects a driving speed of the vibration type driving apparatus;

a frequency controller which determines a frequency of a driving signal from a difference between a speed signal provided by the speed detector and a provided speed instruction value;

a modulator which determines a phase modulation amount and an amplitude modulation amount in accordance with a predetermined parameter corresponding to a driving speed of the vibration type driving apparatus;

a phase controller which generates a signal whose driving signal is phase-modulated in accordance with the phase modulation amount determined by the modulator; and

an amplitude controller which independently performs amplitude modulation on each of the driving signals in accordance with the amplitude modulation amount determined by the modulator.

13. (Currently Amended) The control apparatus according to claim 9 [[4]], wherein the driving unit comprises:

a speed detector which detects a driving speed of the vibration type driving apparatus;

a frequency controller which determines a driving frequency from a difference between a speed signal provided by the speed detector and a provided speed instruction value;

a modulator which determines an amplitude modulation amount in accordance with a predetermined parameter corresponding to a driving speed of the vibration type driving apparatus; and

an amplitude controller which independently performs amplitude modulation on each of the driving signals in accordance with the amplitude modulation

amount determined by the modulator.

14. (Currently Amended) The control apparatus according to claim 7 [[2]], wherein the driving unit comprises:

a speed detector which detects a driving speed of the vibration type driving apparatus;

a frequency controller which determines a driving frequency from a difference between a speed signal provided by the speed detector and a provided speed instruction value to output a pulse signal;

a modulator which determines a phase modulation amount and a pulse width modulation amount in accordance with a predetermined parameter corresponding to a rotation speed of the vibration type driving apparatus;

a phase controller which phase-modulates the pulse signal in accordance with the phase modulation amount determined by the modulator; and

a pulse width controller which independently performs pulse width modulation on each pulse signal in accordance with the pulse width modulation amount determined by the modulator, and

the plurality of driving signals are generated by a signal generator formed of a switching element which outputs a power supply voltage in accordance with the pulse signal subjected to the phase modulation and pulse width modulation and a voltage booster which increases the power supply voltage.

15. (Currently Amended) The control apparatus according to claim 9 [[4]], wherein the driving unit comprises:

a speed detector which detects a driving speed of the vibration type driving apparatus;

a frequency controller which determines a driving frequency from a difference between a speed signal provided by the speed detector and a provided speed instruction value to output a pulse signal;

a modulator which determines a pulse width modulation amount in accordance with a predetermined parameter corresponding to a rotation speed of the vibration type driving apparatus; and

a pulse width controller which performs pulse width modulation on the pulse signal in accordance with the pulse width modulation amount determined by the modulator, and

the plurality of driving signals are generated by a signal generator formed of a switching element which outputs a power supply voltage in accordance with the pulse signal subjected to the pulse width modulation and a voltage booster which increases the power supply voltage.

16. (Original) A control apparatus for a vibration type driving apparatus which comprises a vibrating body including an elastic body and an electro-mechanical energy conversion element, and a contact body in contact with the vibrating body, the vibrating body and the contact body are relatively moved by applying a plurality of driving

signals to the electro-mechanical energy conversion element to excite a traveling vibration on the vibrating body, the control apparatus comprising:

a driving unit which simultaneously excites a plurality of traveling vibrations with different frequencies.

17. (Original) The control apparatus according to claim 16, wherein the plurality of traveling vibrations includes traveling vibrations with different traveling directions.

18. (Original) The control apparatus according to claim 16, wherein the driving unit varies the number of simultaneously excited traveling vibrations in accordance with a provided speed instruction value.

19. (Original) The control apparatus according to claim 16, wherein the driving unit varies the number of traveling vibrations with the same traveling directions in accordance with a provided speed instruction value.

20. (Original) The control apparatus according to claim 16, wherein the driving unit varies the number of simultaneously excited traveling vibrations in accordance with the driving speed of the vibration type driving apparatus.

21. (Original) The control apparatus according to claim 16, wherein the driving unit varies the number of traveling vibrations with the same traveling directions in accordance with the driving speed of the vibration type driving apparatus.

22. (Original) The control apparatus according to claim 16, wherein the driving unit comprises:

a speed detector which detects a driving speed of the vibration type driving apparatus;

a frequency controller which determines a driving frequency of each of the plurality of traveling vibrations from a difference between a speed signal provided by the speed detector and a provided speed instruction value; and

a signal generator which generates the driving signals for exciting the plurality of traveling vibrations in accordance with the driving frequencies determined by the frequency controller.

23. (Original) The control apparatus according to claim 16, wherein the driving unit comprises:

a speed detector which detects a driving speed of the vibration type driving apparatus;

a frequency controller which determines a driving frequency of each of the plurality of traveling vibrations from a difference between a speed signal provided by the speed detector and a provided speed instruction value;

a phase controller which determines a time phase difference between a plurality of standing waves forming each of the plurality of traveling vibrations from the speed instruction value; and

a signal generator which generates the driving signals for exciting the plurality of traveling vibrations in accordance with the driving frequencies determined by the frequency controller and the time phase difference determined by the phase controller.

24. (Original) The control apparatus according to claim 16, wherein the driving unit comprises:

a speed detector which detects a driving speed of the vibration type driving apparatus;

a frequency controller which determines a driving frequency of each of the plurality of traveling vibrations from a difference between a speed signal provided by the speed detector and a provided speed instruction value;

a phase controller which determines a time phase difference between a plurality of standing waves forming each of the plurality of traveling vibrations from the driving speed; and

a signal generator which generates the driving signals for exciting the plurality of traveling vibrations in accordance with the driving frequencies determined by the frequency controller and the time phase difference determined by the phase controller.

25. (Original) A control apparatus for a vibration type driving apparatus which comprises a vibrating body including an elastic body and an electro-mechanical energy conversion element, and a contact body in contact with the vibrating body, the vibrating body and the contact body are relatively moved by applying a plurality of driving signals to the electro-mechanical energy conversion element to excite a traveling vibration on the vibrating body, the control apparatus comprising:

a driving unit which generates a first driving signal exciting a first traveling vibration and a second driving signal exciting a second traveling vibration whose frequency differs from that of the first traveling vibration, each of the first and second driving signal forming a group of intermittent driving signals, and which alternately applies the first driving signal and the second driving signal to the electro-mechanical energy conversion element, furthermore, while an attenuated vibration of one of the first and second traveling vibration occurs, superposes the other traveling vibration thereon.

26. (Original) The control apparatus according to claim 25, wherein, in the group of the first driving signals, time phases of the first driving signals are the same, and, in the group of the second driving signals, time phases of the second driving signals are the same.

27. (Original) The control apparatus according to claim 25, wherein the driving unit makes a phase of the traveling vibration at the start of the application of the

driving signals coincide with a phase of the attenuated vibration of the traveling vibration excited by each of the driving signals before generating the intermittent driving signals.

28. (Original) The control apparatus according to claim 25, wherein the driving unit causes the traveling direction of the attenuated vibration of the first traveling vibration to be different from the traveling direction of the second traveling vibration.

29. (Original) The control apparatus according to claim 25, wherein the driving unit comprises:

a speed detector which detects a driving speed of the vibration type driving apparatus;

a frequency controller which determines a driving frequency of each of the first and second traveling vibrations from a speed signal provided by the speed detector; and

a signal generator which generates the driving signals for exciting the first and second traveling vibrations in accordance with the driving frequencies determined by the frequency controller.

30. (Original) The control apparatus according to claim 25, wherein the driving unit comprises:

a speed detector which detects a driving speed of the vibration type driving apparatus;

a frequency controller which determines a driving frequency of each of the first and second traveling vibrations from a speed signal provided by the speed detector;

a time controller which determines a duration for which each of the first and second traveling vibrations is forced, in accordance with the speed signal provided by the speed detector; and

a signal generator which generates the driving signals for exciting the first and second traveling vibrations in accordance with the driving frequencies determined by the frequency controller and the durations determined by the time controller.

31. (Currently Amended) An actuating apparatus comprising:

the control apparatus according to claim 7 ~~any one of claims 1 to 30~~;

a vibration type driving apparatus controlled by the control apparatus; and

a driving mechanism driven by the vibration type driving apparatus.

32-35. (Cancelled)

36. (Original) A method of controlling a vibration type driving apparatus which comprises a vibrating body including an elastic body and an electro-mechanical energy conversion element, and a contact body in contact with the vibrating body, the vibrating body and the contact body are relatively moved by applying a plurality of driving signals to the electro-mechanical energy conversion element to excite a plurality of

vibrations with the same shape and different positional phases on the vibrating body and combining the plurality of vibrations into a traveling vibration, comprising the step of:

controlling the driving signals such that the traveling vibration includes a traveling wave component whose amplitude is constant and a standing wave component whose positional phase changes.

37. (Original) The control method according to claim 36, wherein amplitudes and phases of the plurality of driving signals are periodically changed with different time phases in the step.

38. (Original) The control method according to claim 36, wherein amplitudes of the plurality of driving signals are periodically changed with different time phases in the step.

39. (Original) A method of controlling a vibration type driving apparatus which comprises a vibrating body including an elastic body and an electro-mechanical energy conversion element, and a contact body in contact with the vibrating body, the vibrating body and the contact body are relatively moved by applying a plurality of driving signals to the electro-mechanical energy conversion element to excite a traveling vibration on the vibrating body, comprising the step of:

simultaneously exciting a plurality of traveling vibrations with different frequencies.

40. (Original) The control method according to claim 39, wherein the plurality of traveling vibrations include traveling vibrations with different traveling directions in the step.

41. (Original) A method of controlling a vibration type driving apparatus which comprises a vibrating body including an elastic body and an electro-mechanical energy conversion element, and a contact body in contact with the vibrating body, the vibrating body and the contact body are relatively moved by applying a plurality of driving signals to the electro-mechanical energy conversion element to excite a traveling vibration on the vibrating body, comprising the step of:

generating a first driving signal exciting a first traveling vibration and a second driving signal exciting a second traveling vibration whose frequency differs from that of the first traveling vibration, each of the first and second driving signals forming a group of intermittent driving signals, and alternately applying the first driving signal and the second driving signal to the electro-mechanical energy conversion element, furthermore, while an attenuated vibration of one of the first and second traveling vibration occurs, superposing the other traveling vibration thereon.

42. (Original) The control method according to claim 41, wherein, in the group of the first driving signals, time phases of the first driving signals are the same, and, in the group of the second driving signals, time phases of the second driving signals are the same.

43. (Original) The control apparatus according to claim 41, wherein, further comprising the step of making a phase of the traveling vibration at the start of the application of the driving signals coincide with a phase of the attenuated vibration of the traveling vibration excited by each of the driving signals before generating the intermittent driving signals.

44. (Original) The control apparatus according to claim 41, wherein the traveling direction of the attenuated vibration of the traveling vibration is caused to be different from the first traveling direction of the second traveling vibration in the step.

45. (Currently Amended) A storage medium, readable by an information processing apparatus, storing a program including program codes capable of realizing the control method according to claim 36 ~~32~~, the program being executable by the information processing apparatus.

46. (Original) A storage medium, readable by an information processing apparatus, storing a program including program codes capable of realizing the control method according to claim 39, the program being executable by the information processing apparatus.

47. (Original) A storage medium, readable by an information processing apparatus, storing a program including program codes capable of realizing the control method according to claim 41, the program being executable by the information processing apparatus.